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Mapping Water Inundation Using Hydraulic Models, GIS and Python

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What are hydraulic models and why are they important?

- HEC-RAS
  - Calculates water surface
  - Cross sections
  - Storage areas
  - Evaluate impacts

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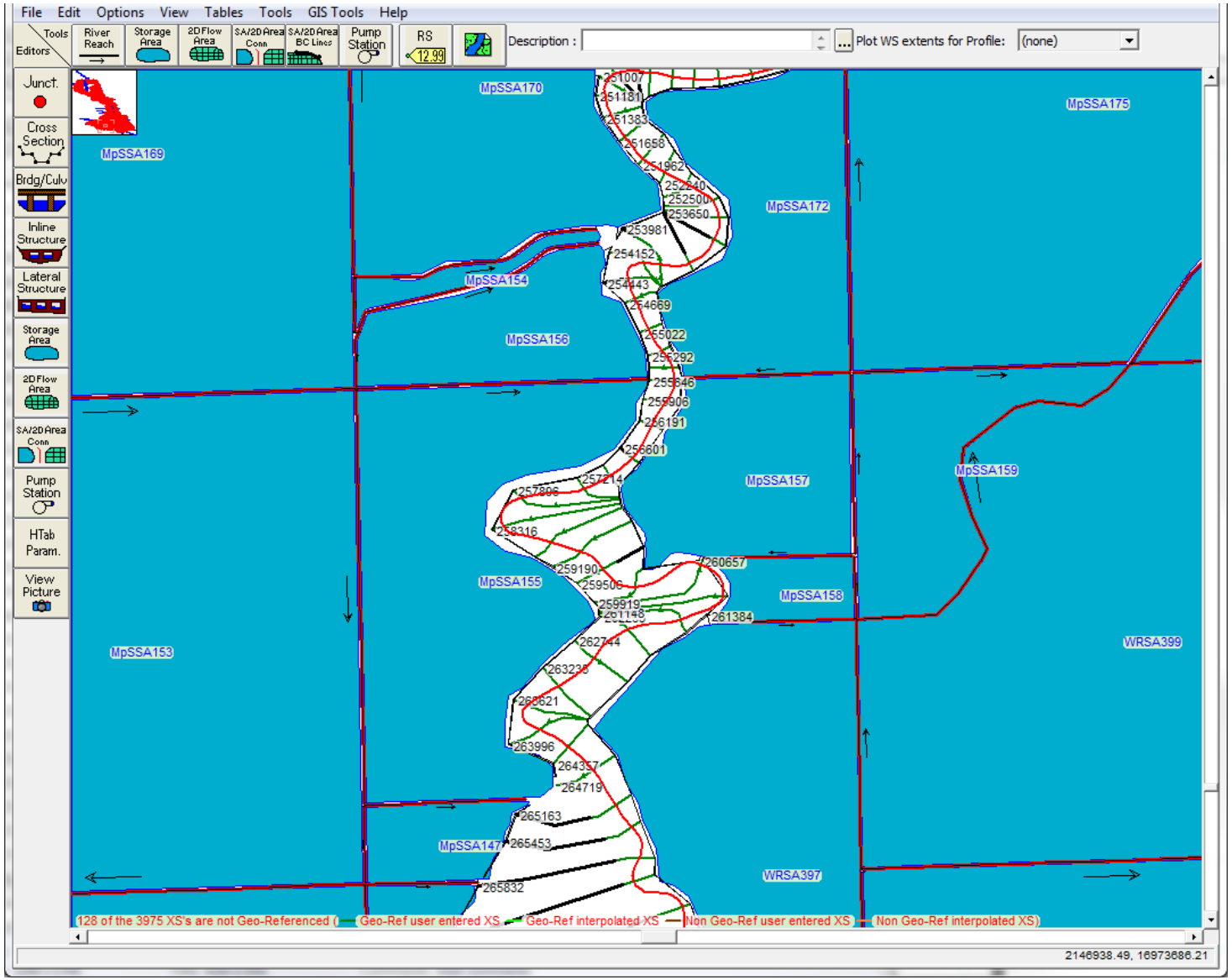

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How does HEC-RAS communicate with GIS?

- Geo-RAS
- Mapping Results

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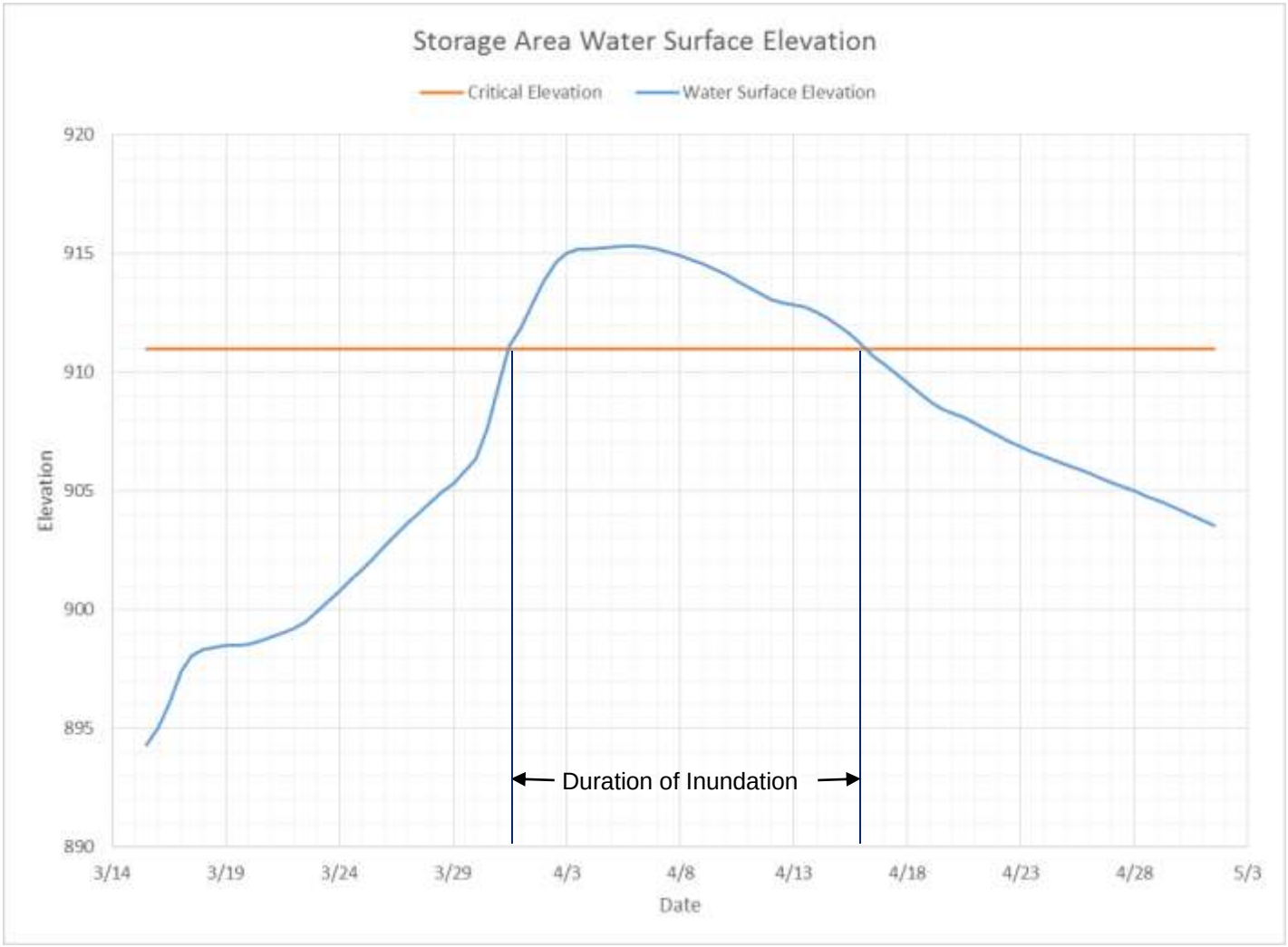

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Increasing Communication between HEC-RAS & GIS?

- Python to the rescue

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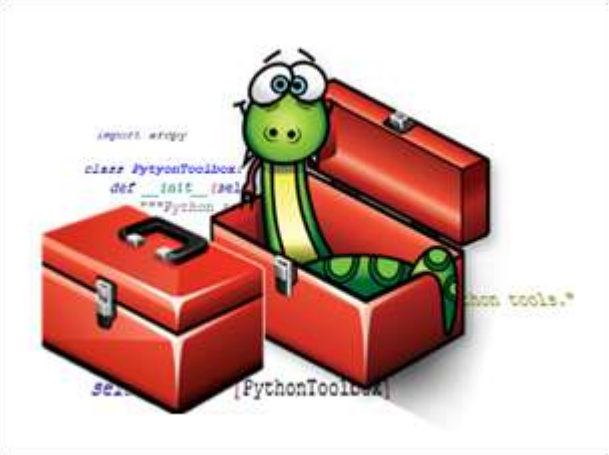
What is Python?



- Scripting language
  - Powerful
  - Versatile
  - Fast to develop in
  - Created by Guido Van Rossum (1989)
  - ESRI created ArcPy

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Programming Language Hall of Fame

The hall of fame listing all "Programming Language of the Year" award winners is shown below. The award is given to the programming language that has the highest rise in ratings in a year.

Year	Winner
2014	JavaScript
2013	Transact-SQL
2012	Objective-C
2011	Objective-C
2010	Python
2009	Go
2008	C
2007	Python
2006	Ruby
2005	Java
2004	PHP
2003	C++

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Standalone Python Script for Modeling Water Inundation

- How?
  - Data mined HEC-RAS
  - ESRI's ArcPy module
  - Tkinter module

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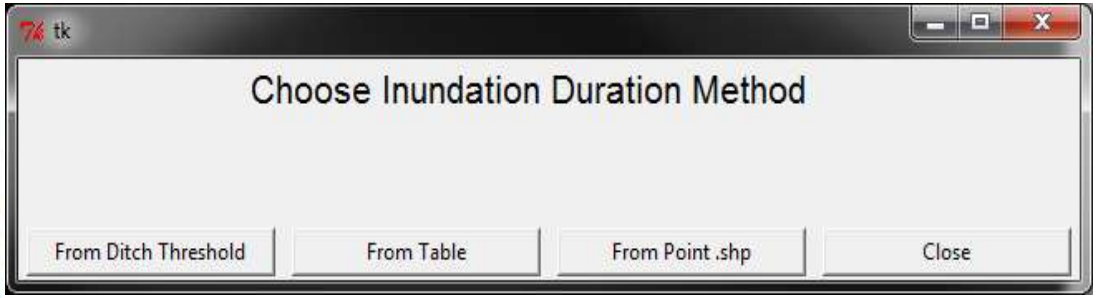
Enough of the History!
So what did you do?

- Python script (3526 lines)
  - Identify critical elevation
    - Ditch threshold
    - From .shp point file
    - From table:
      - .csv
      - Any .shp with Elevation



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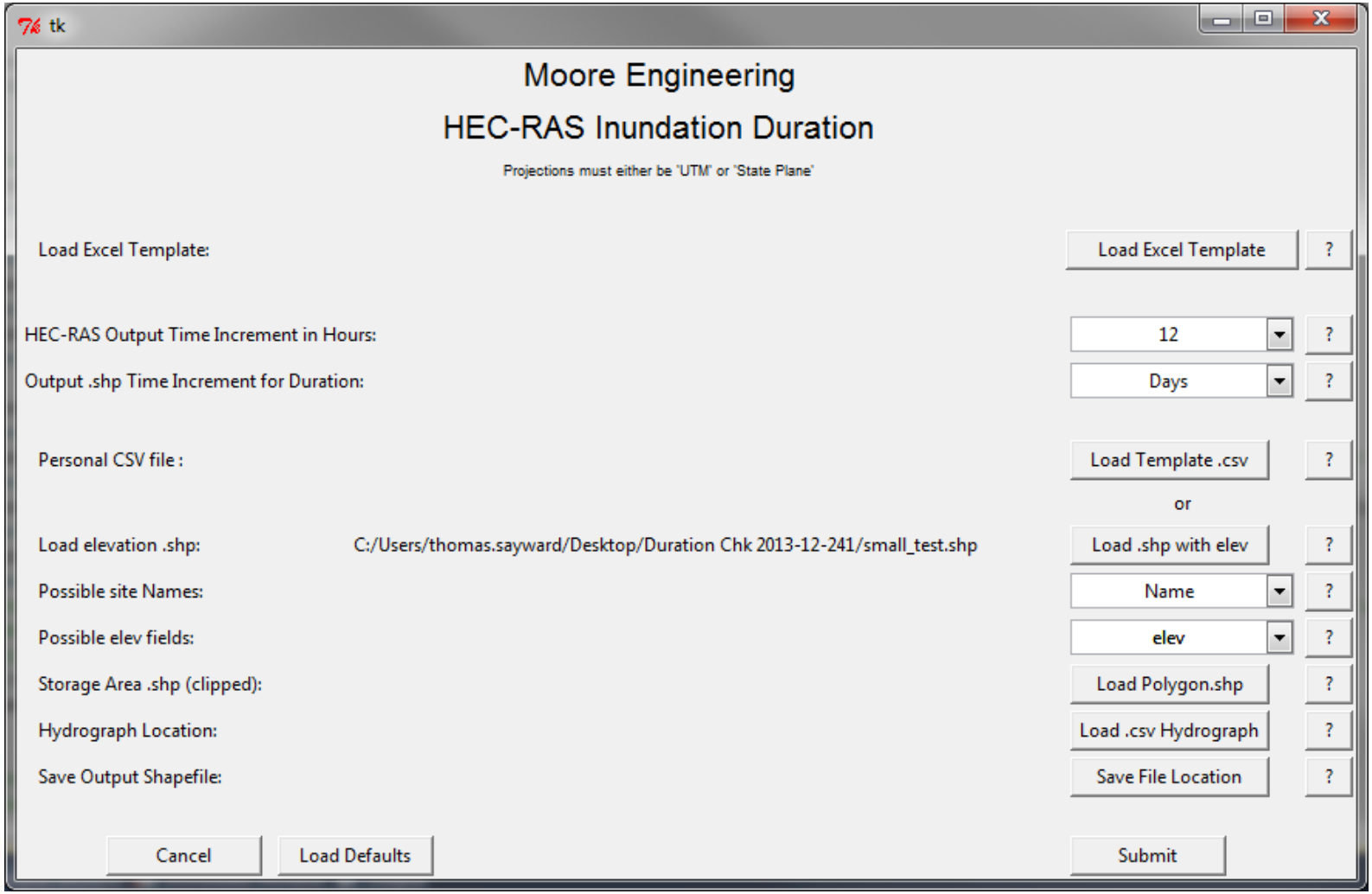
From Table



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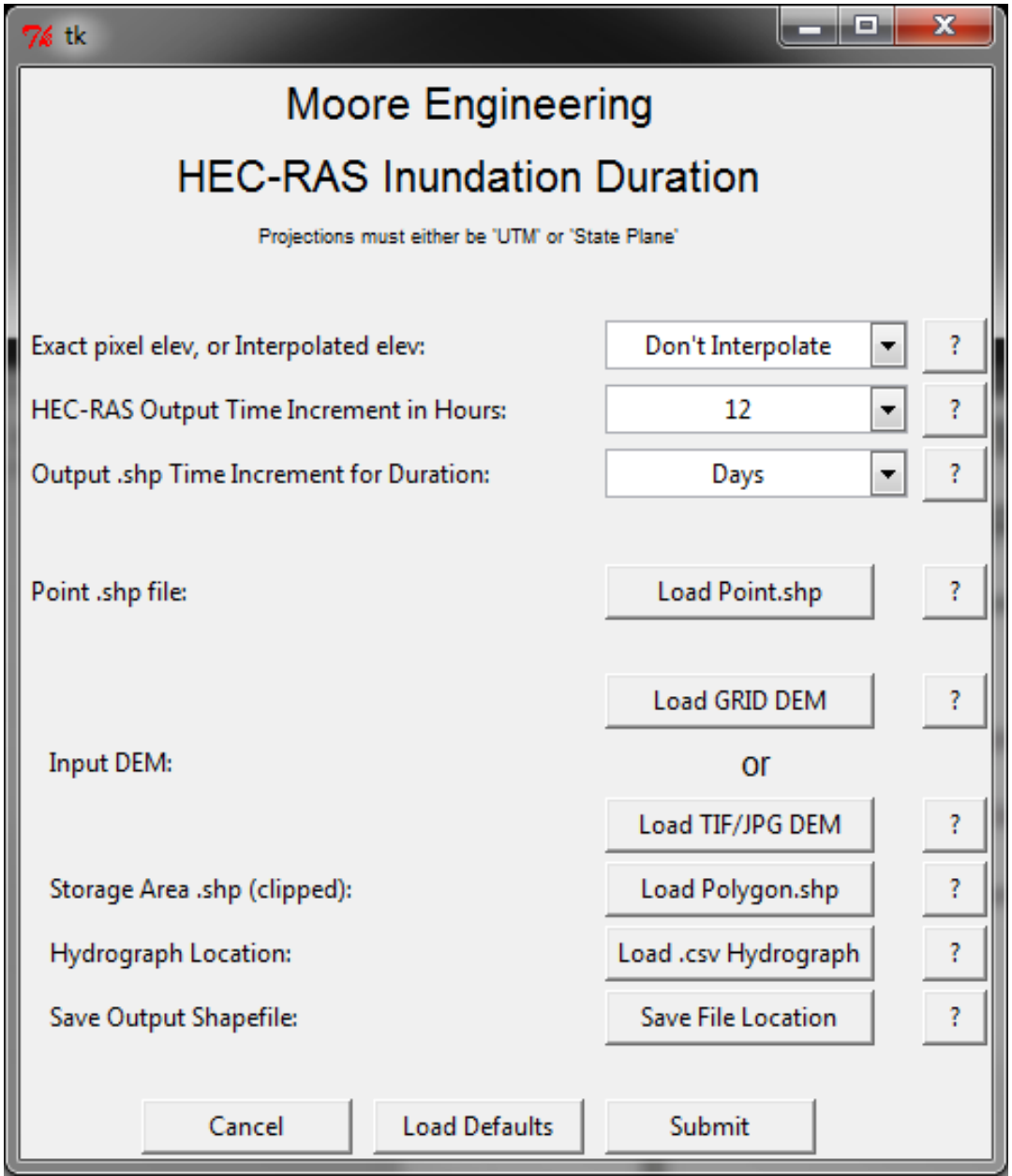
From .shp point file



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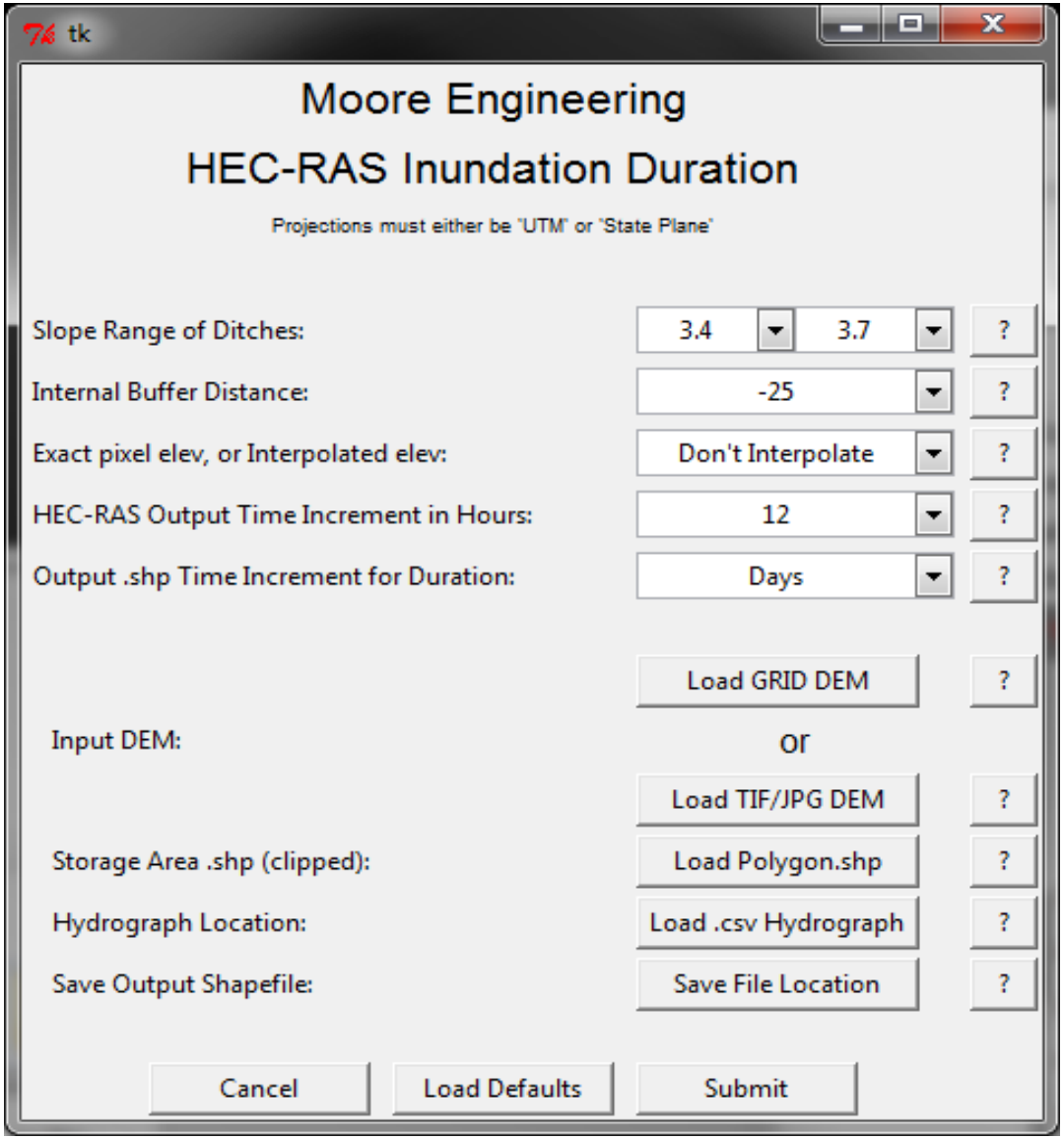
From Ditch Threshold



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Code Snipit

Inundation_Duration1.py - T:\ArcView\Scripts_Tbx\Scripts\Stand_Alone_HEC_RAS\Inundation Duration\Inundation_Duration1.py

File Edit Format Run Options Windows Help

```
        else: #a backup copy doesn't exist with this name, and creates a SApoly.shp back up in the subfolder
            print "now creating backup of SApoly.shp prior to repair geometry"
            arcpy.CopyFeatures_management(shp_location_local, backup_path)

        print "now repairing geometry"
        path, fname =  str(shp_location_local).rsplit("/",1)
        fname, ext = str(fname).rsplit(".")
        fname = fname +str("_rg")
        shp_rg_path = path +"/"+ fname +"."+ext #renamed file, showing repair geometry has been done to it
        if os.path.exists(shp_rg_path):
            print("this file name already exists '" + str(shp_rg_path)+"'")
            i = 1
            while os.path.exists(shp_rg_path):
                shp_rg_path =  path + "/"+ fname + "_" + str(i) +"."+ ext
                print("this file name already exists '" + str(shp_rg_path)+"'")
                i +=1

        arcpy.CopyFeatures_management(shp_location_local, shp_rg_path) #creates a new .shp in the same directory
        arcpy.RepairGeometry_management(shp_rg_path) #repairs geometry on the orgional .shp

        shp_location = shp_rg_path  #.shp with repaired geometry
        ###############################################################################




        print "Now begining the analysis"
        print "Now copying the point.shp to 'C:/Temp/Inundation_duration/'"
        f_shppt_name = "" #holds the point shapefile file name

        #gets the file name from the pt.shp
        try:
            print new_save_location
            f_shppt_name = str(new_save_location).rsplit("/",1)
            print f_shppt_name
        except:
            print "an error occured spliting the save-as file path"
            pass
```

Ln: 1 Col: 0

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Duration 6.5 ElevC915
Duration 14.5 ElevC910
Duration 15.5 ElevC909
Duration 22 ElevC906
Duration 11 ElevC911
Duration 15 ElevC907
Duration 16 ElevC906
Duration 11.5 ElevC912
Duration 22 ElevC906
Duration 12 ElevC911
Duration 13 ElevC909
Duration 15 ElevC907
Duration 13.5 ElevC911
Duration 14.5 ElevC910
Duration 10.5 ElevC913
Duration 23.5 ElevC911
Duration In Days
0.0
0.1 - 0.5
0.6 - 1.0
1.1 - 2.0
2.1 - 3.0
3.1 - 5.0
5.1 - 10.0
10.1 - 20.0
20.0 +
Inundation Duration
Existing Conditions
N
W
E
S
0
1,000
2,000
4,000
Feet
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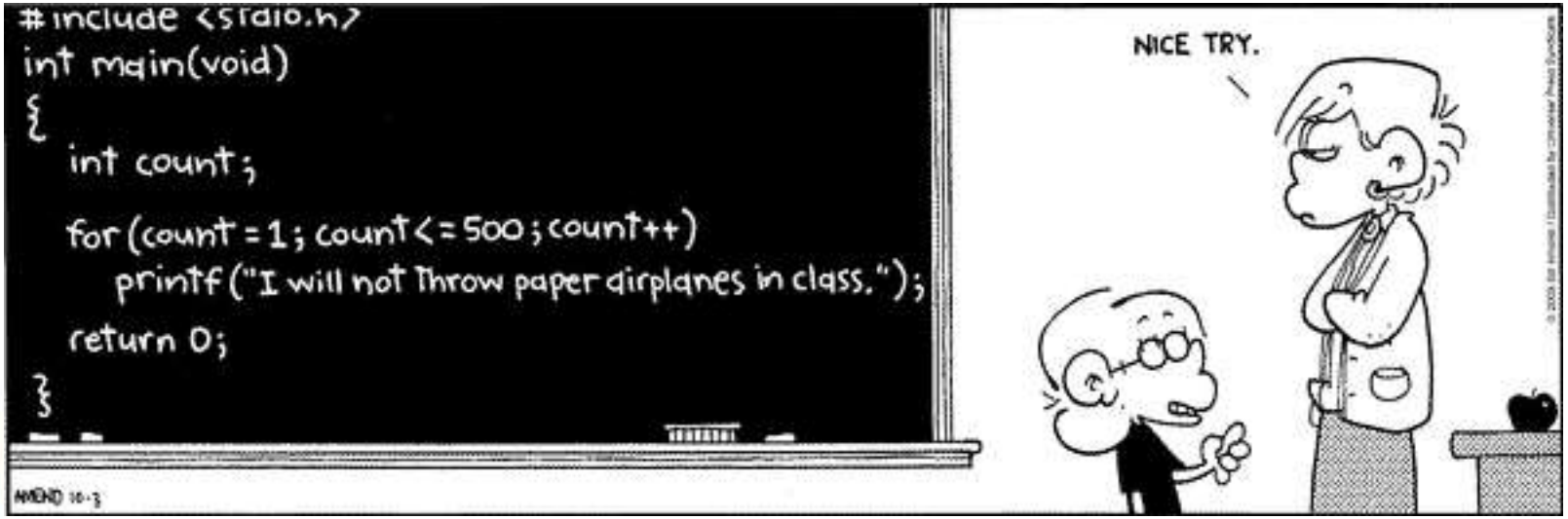
Questions?



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